Student-Course Network Analysis Proposal

Kelly Gothard

UVM Office of Institutional Research

**Introduction**

Student engagement in community-based activities are valuable, measurable indicators for a student's future success. The specific tasks associated with these activities can be beneficial for stimulating a student's interest in their major or their favorite recreational activities, but the social benefits that come with being engages in community-based activities are arguably just as important in setting up a student for success and keeping them engaged with the university. The most central source of socialization in universities is in classes, and is most noticeable when students share classes with the same cohort of students. Tightly knit communities of students that take the same courses may be more likely to study together, engage in extracurricular activities together, encourage class attendance, and also encourage retention. Having close friends in class facilitates the feeling of belonging to a community that is rooted in the university. The connectedness of students within their courses may be an indicator for future success at the university, and can be studied by looking at the network of students to courses.

**Methods**

The dataset will contain an entry for each course that a student took, the student’s information (identifier, major, college, etc), for some number of semesters. A bipartite network will be constructed, where nodes on one side represent students and nodes on the other side represent courses and an edge between nodes represents a student that took a course (see Figure 1 below for an example). The projection of the bipartite network onto the ‘student space’ will show each student in the dataset. Connections of weight n between students indicate that a student took n classes with another student (see Figure 2). This network is a useful representation of the social network that is created by students taking classes together, and the position of a student on that network can be used to determine a measure of connectivity for an individual student.

Social networks often exhibit homophily-driven bias; birds of a feather flock together. In this project, students who are in the same major program will already be taking courses together, and some major programs are more ‘tight-knit’ than others. For example, the electrical engineering program has a strict set of courses and a strict order that those courses should be taken in, whereas the data science major is far less structured and has various paths and electives that could be taken by data science students. To account for variation among major programs, the network will be ‘chopped up’ into subnetworks of each major, and each student’s relative connectivity will be measured in their major group. This process can also be repeated by college.

We will then study the relationship between course-driven social connectivity and GPA, retention, major-changes, college-changes, and more. We can also measure inter-major connectivity, inter-college connectivity, inter-race/ethnicity connectivity, etc to study the interactions between various groups at UVM.